United States
Department of
Agriculture

**Soil
Conservation
Service**

Columbia,
Missouri

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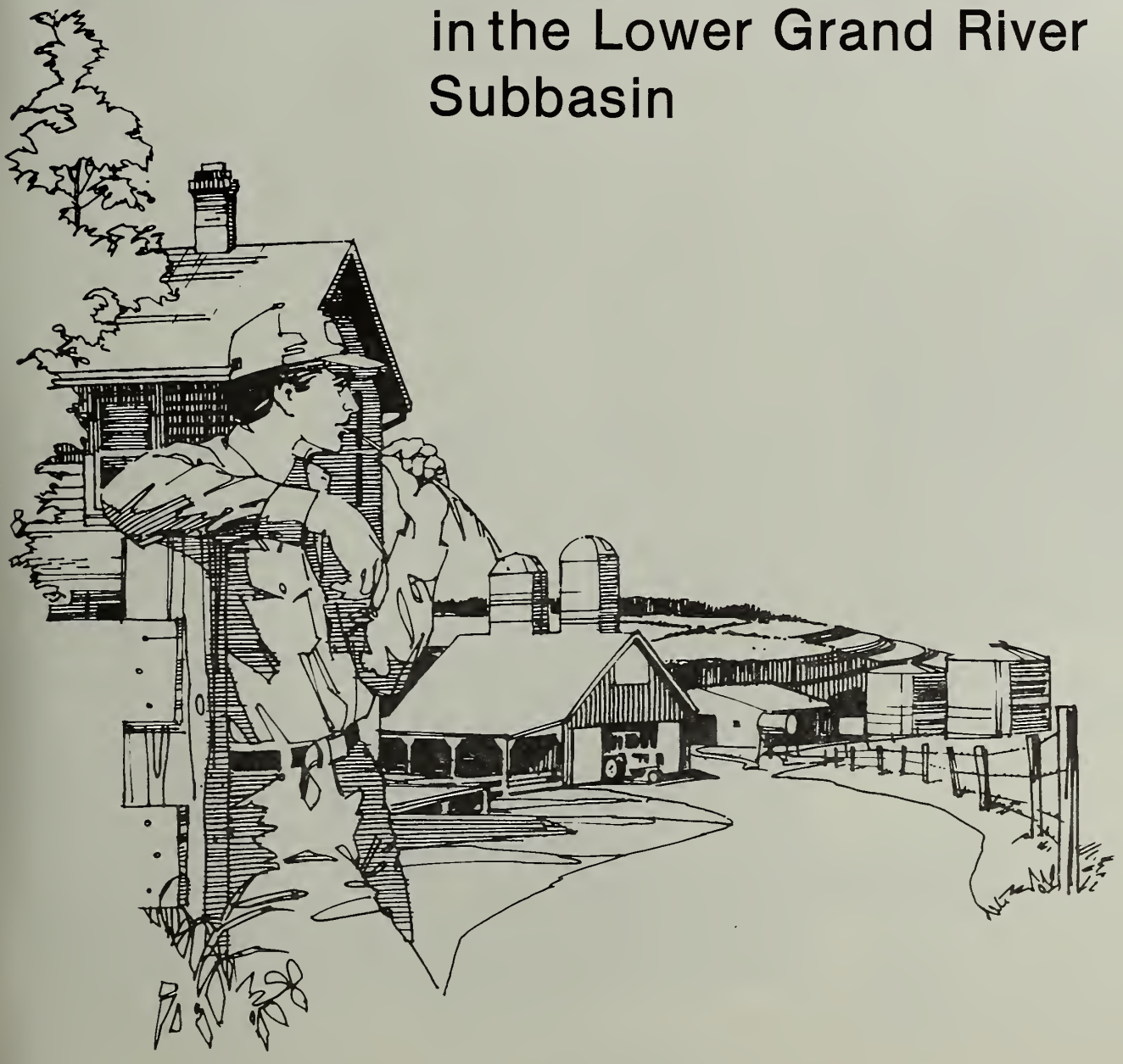
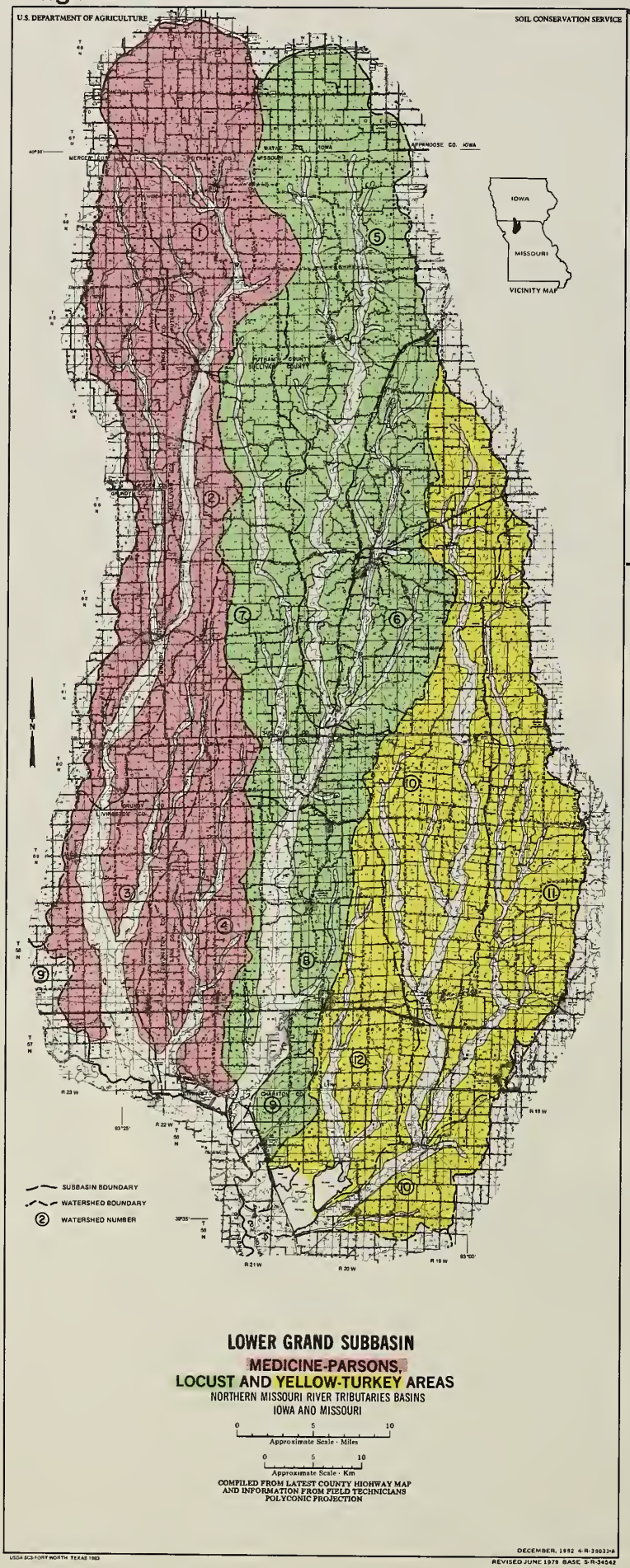
Saving Ground

An Overview of Solutions to Land and Water Problems in the Lower Grand River Subbasin





THE AREA

The Lower Grand River Subbasin drains about 1,866 square miles; 125 miles in Iowa and 1,741 in Missouri. The areas that drain into the Medicine, Locust and Yellow Creeks and their tributaries make up the subbasin. An integral part of the Central Feed Grain and Livestock Region, the subbasin lies within the land resource area known as the Iowa and Missouri Heavy Till Plain. Mixed clay, gravel and boulders are exposed or thinly covered on side slopes. Upper ridges are blanketed with wind blown silt. Flood plains are generally wide and flat.

The Lower Grand River Subbasin was divided into 12 watersheds, and flood reduction alternatives were prepared for each watershed. The benefits that could result amount to $5.3 million annually.

	Watershed	Acres	Percent Upland	Percent Bottom Land
	Medicine-Parsons Area			
(1)	Medicine Creek	111,180	83	17
(2)	West Fork Medicine Creek	130,182	80	20
(3)	Lower Medicine Creek	97,559	69	31
(4)	Parsons Creek	75,001	87	13
	Locust Area			
(5)	Upper Locust	162,114	87	13
(6)	East Fork Locust	79,875	84	16
(7)	West Fork Locust	100,852	87	13
(8)	Lower Locust	70,510	62	38
(9)	Sumner Tributaries	18,539	73	27
	Yellow-Turkey Area			
(10)	West Yellow Creek	172,377	78	22
(11)	East Yellow Creek	110,482	84	16
(12)	Turkey-Elk Creeks	65,870	77	23
		1,194,541		

Deterioration of land and water resources continues in Missouri, as recent economic pressures on farmers and farmland exceed gains in resource protection. Upland soils continue to **erode** away, while bottom land soils **flood.**

At the time of settlement, upland topsoil was 5 to 10 inches deep over 70 percent of the Lower Grand River Subbasin. Topsoil depths over the same area now average 2 to 6 inches deep. About 15 million tons of soil are dislodged annually. In many areas, subsoils are now exposed resulting in lower water infiltration rates and less moisture storage available for plant growth as well as increased runoff, flooding and sedimentation.

OF PUBLIC CONCERN IS THE EFFECTS THE EROSION-FLOODING-SEDIMENTATION PROCESS HAS ON CROP PRODUCTIVITY, FLOOD DAMAGES AND WATER QUALITY.

Erosion in the subbasin

THE MAIN PROBLEM: SHEET AND RILL EROSION

Sheet erosion, the removal of a thin layer of soil, and rill erosion, the small channels caused by runoff, account for 90 percent of all erosion in the subbasin.

Sheet and rill erosion averages 14 tons per acre for all upland and 35 tons per acre for upland cropland. About 77 percent of this erosion occurs on 30 percent of the upland in crops.

The steepest slopes are farmed to a large extent because the less productive soils with steep slopes are intermingled in fields with more productive lower sloping soils.

ONE SOLUTION

Applying soil conservation practices like conservation tillage, terraces, waterways, stripcropping, structures, diversions, etc., would be a major step toward preserving the subbasin's soil resource.

Continued deterioration of the soil by erosion is the most serious resource problem in the subbasin. Denuded land provides little wildlife habitat.

Conservation tillage planting helps to conserve soil by disturbing the seedbed as little as possible during preparation while providing cover for wildlife.

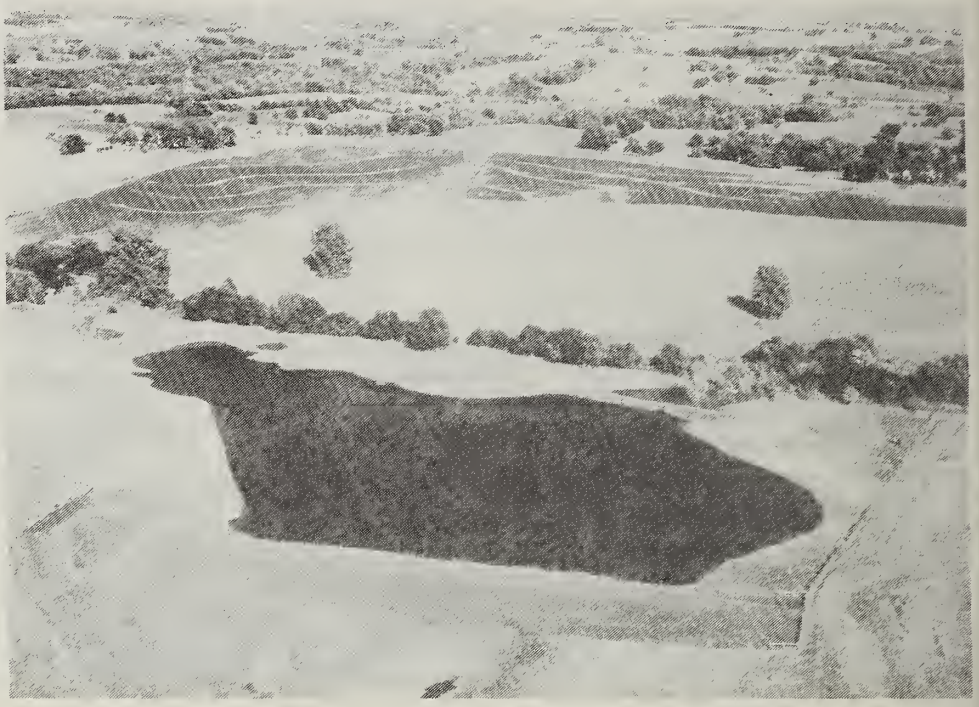
If conservation tillage was adopted on all upland cropland, sheet and rill erosion could be reduced by 47 percent at an annual cost savings to farmers of $1.7 million or about $9 per acre. Steep sloping soils can be converted to pasture at relatively low costs because the net income possible from row crops is not much higher than that possible from pasture.

ANOTHER PROBLEM: GULLY EROSION

Less than 10 percent of the subbasin's erosion is caused by long-lived gullies, but they instigate land losses, depreciate adjoining lands and threaten existing water management systems. They also discourage the installation of erosion control measures and increase the delivery of upland soil loss to streams.

Gullies void and dissect the land. They also increase the amount of eroded soil reaching streams and lakes.

Gullies account for 30 percent of sediments filling channels and 30 percent of sediments deposited in lakes. Therefore, controlling gullies is a basic, long-term solution for upland erosion problems.
One way to control gullies is through integrated resource management systems.



This resource management system provides both grade control and soil and water management through grade stabilization structures, stabilized waterways, terraces and conservation tillage.

Flooding in the subbasin

Floods in the subbasin cause an average of $8.5 million in damages each year

AREAS	FLOOD DAMAGES (Millions of Dollars) PRESENT	FUTURE	FLOOD PLAIN (Acres x 1000)
Medicine-Parsons	3.62	4.96	69
Locust	2.45	3.62	51
Yellow-Turkey	2.39	3.60	44
TOTALS	8.46	12.18	164

About 187,000 tons of sediment are deposited in an average year in the subbasin's ponds and lakes. Another 163,000 tons of sediment are deposited in the subbasin's streams reducing quantity and quality of fishery habitat.

Backwaters of ponds and lakes are the first areas to show evidence of filling.

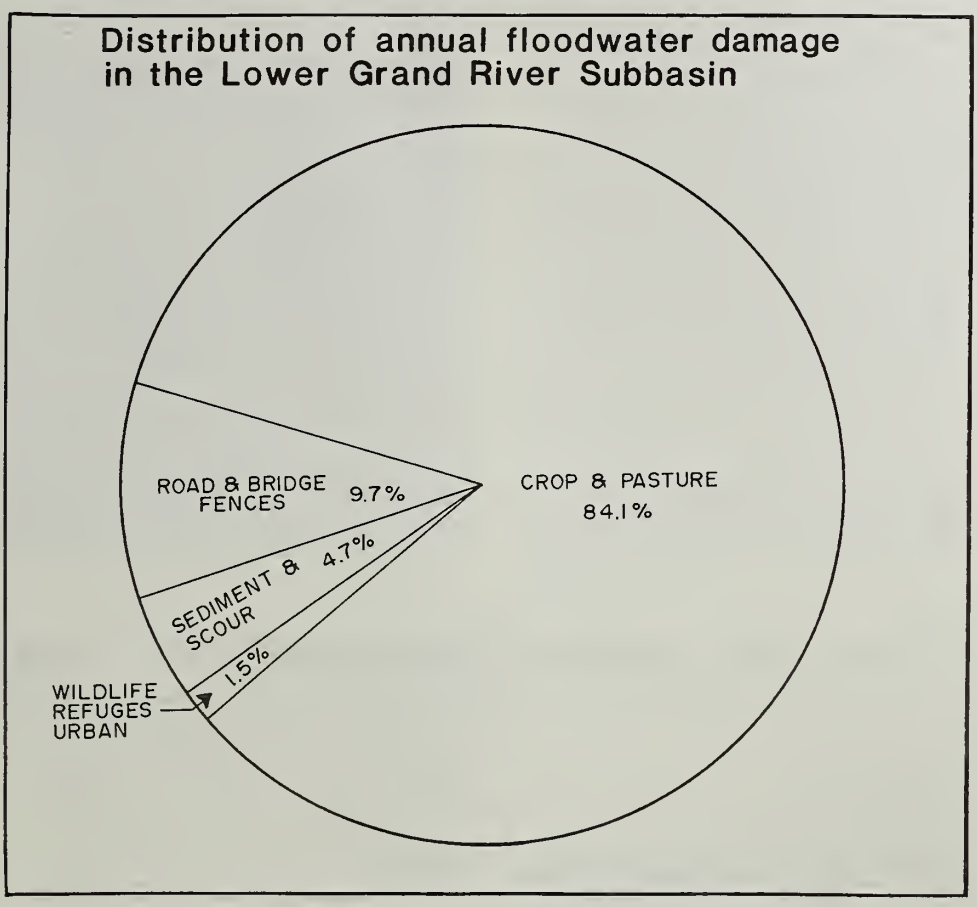
Average annual damages to residences and businesses in the city of Brookfield amount to $40,500.

This July 1983 flood in Brookfield, Missouri, disrupted residential traffic and caused considerable cleanup problems.

Most floods occur during the growing season with 84 percent of the damages occurring to crops and pastures. Immature plants frequently die due to lack of oxygen and nutrient deprivation. Flooded plants are more susceptible to diseases, and insect and fungus infestations. Floodwater damages to crops and pastures are estimated to average $7.1 million a year.

Subbasin flood damages are expected to increase to an average $10.6 million by the year 2000.

Channel sediment deposits increase flooding by reducing channel capacities to carry floodwater. Sediment deposits on immature plants increase heat absorption which increases plant susceptibility to wilting. Sediment deposits on pasture grass decrease its palatability to animals and taxes their digestive systems. Untimely sediment deposition commonly requires additional field preparation, smoothing, fertilization, and application of pesticides and insecticides. These damages are estimated to cost $343,000 each year.



Sand bedloads fill channels, increase flooding and create continuous shallow runs without pools, which decreases the diversity and quality of stream fishery habitat.

Untimely flooding of crops planted for wildlife at the Swan Lake National Wildlife Refuge and Missouri's Fountain Grove Wildlife Management Area cause 86,500 dollars in damages annually. Sediment entering the Swan Lake National Wildlife Refuge is filling Swan Lake at a rate of 0.23 inches per year, Silver Lake at a rate of 0.17 inches per year, and South Lake at a rate of 0.13 inches per year.

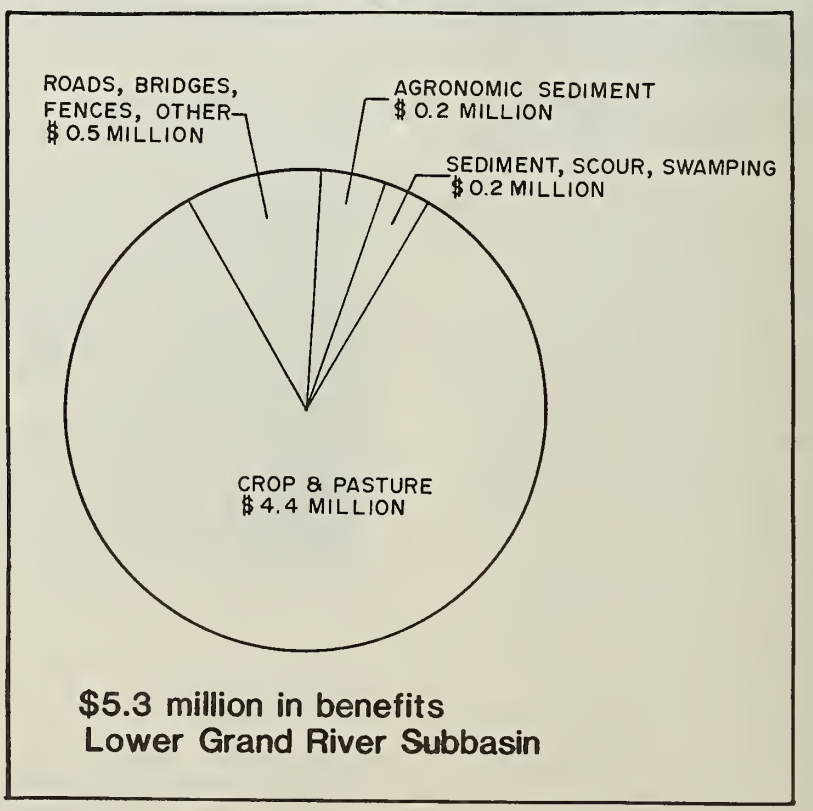
Drying cracks are visible in this nearly uniform accumulation of silt deposits. The result in this field was a 100 percent kill of soybeans.

The complete management approach

A system of floodwater retarding dams can reduce flooding and allow better management of the valuable resources — WATER AND LAND.

A soil and water resource management system which includes flood prevention measures would greatly reduce flood damages. Measures considered as alternatives are floodwater retarding dams, dike-floodway systems, and in some isolated cases, debris removal in streams. Planned dams will retard storm runoff and release stored waters at controlled rates. Dike-floodway systems can be designed to augment the control of floodwater. If installed, dikes should be installed as part of an integrated system providing additional protection to the entire flood plain. Properly designed dike systems should include adequate outlets to drain storm water from outside the dikes. Dikes should be considered as a means of providing flood protection only after adequate design and environmental impact considerations. Installation of upland watershed programs in the subbasin will conserve soil, reduce agricultural and urban flood damages and extend the life and management of wildlife refuges.

Alternative plans



$5.3 million in benefits
Lower Grand River Subbasin

Alternative plans were formulated for the reduction of flood, erosion, and sediment damages. Floodwater retarding measures include dams and/or dikes. The most favorable alternative from each watershed having maximum net economic benefits is displayed in the following bar chart. Nine of the 12 watersheds studied showed potential for developing a comprehensive watershed protection and flood prevention plan.

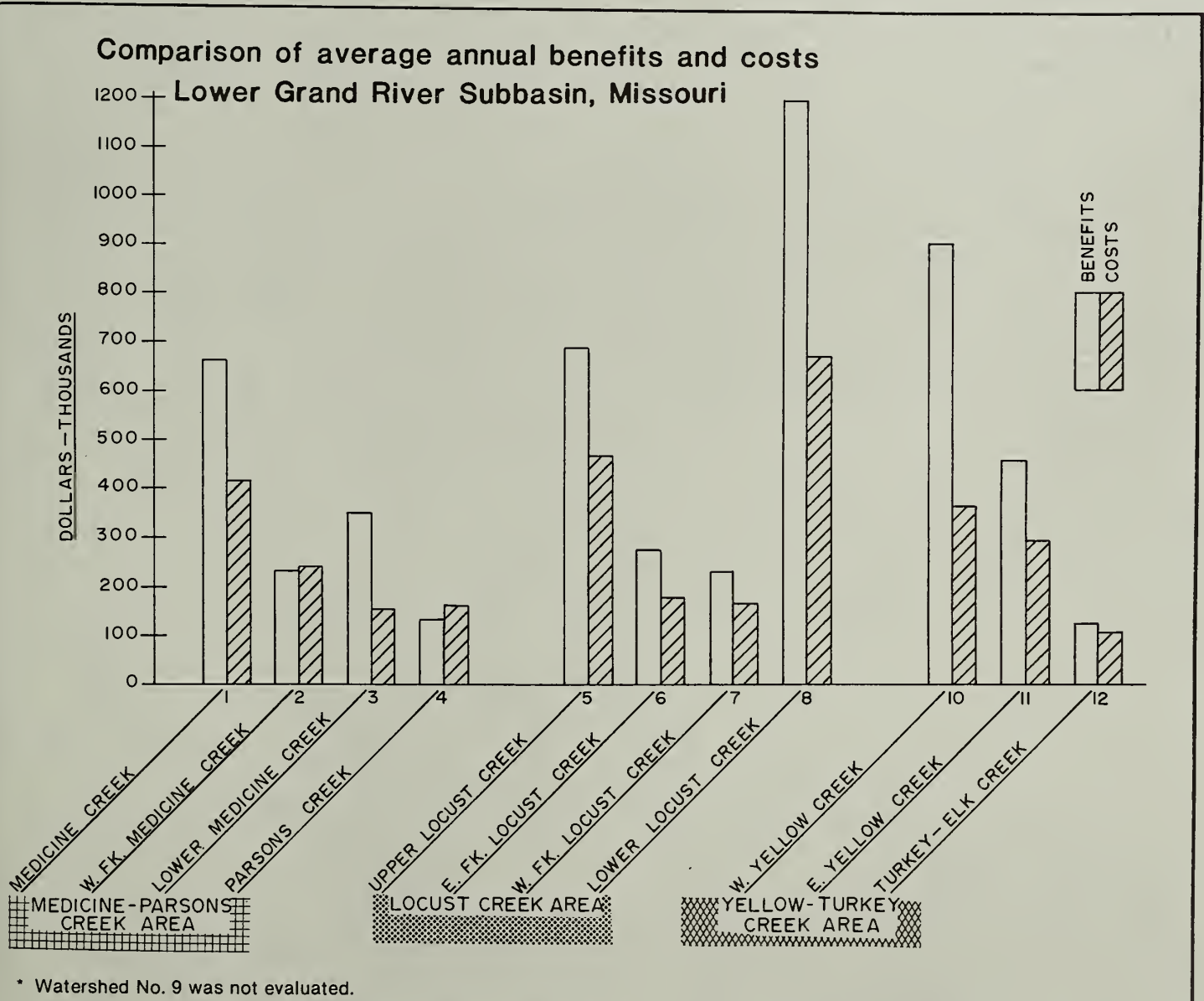
OPPORTUNITIES FOR IMPLEMENTATION

Public Law 566, the Watershed Protection and Flood Prevention Act, was approved by the 83rd Congress in 1954 to prevent erosion, floodwater and sediment damages. The act established small watershed programs designed to preserve, protect and improve land and water resources and enhance the environment.

Opportunity exists in the Lower Grand River Subbasin to implement upland watershed programs to conserve soil, reduce agricultural and urban flood damages, and extend the life and facilitate management of wildlife refuges of state and national importance. Joint planning with the Missouri Department of Conservation and the U.S. Fish and Wildlife Service should lead to a better understanding of project measures that can be included in small watershed programs to improve habitat conditions on both wildlife areas and private lands.

Joint planning with the city of Brookfield should result in a program to reduce future urban flood damages. A flood plain management study sponsored by the city of Brookfield, Missouri, and Chariton and Linn Counties is currently under way on Elk Creek.

The Upper Locust Creek Watershed has been authorized for planning. Projects in preauthorization planning are the East Locust Creek, Medicine Creek, and East Yellow Creek Watersheds. Joint planning with soil and watershed conservation districts should result in showpiece watersheds benefiting all interest groups.



* Watershed No. 9 was not evaluated.

Other reports related to this topic:

Losing Ground provides specific, detailed information on the degree of soil and water resource problems in the Northern Missouri River Tributaries Basin, which includes the Lower Grand River Subbasin.

Locust Creek Area is a technical report providing specific, detailed information on the degree of soil and water resource problems in the Locust Creek Area and alternative plans for Erosion and Flood Control.

Medicine-Parsons Creeks Area is a technical report providing specific, detailed information on the degree of soil and water resource problems in the Medicine-Parsons Creeks Area and alternative plans for Erosion and Flood Control.

Yellow-Turkey Creeks Area is a technical report providing specific, detailed information on the degree of soil and water resource problems in the Yellow-Turkey Creeks Area and alternative plans for Erosion and Flood Control.

Soil Erosion — A Threat to Land Quality is a technical report which measures relationships between land use, soils, conservation practices and sheet and rill erosion. The short-run economics of step-by-step erosion reduction is analyzed using a computer model.

The study on the Lower Grand River Subbasin was conducted by the Economic Research Service, Forest Service, and Soil Conservation Service of the United States Department of Agriculture. The study was done in cooperation with the State of Missouri through the Department of Natural Resources.

For more information contact your local SCS office. The Soil Conservation Service is listed in local telephone directories under "United States Government, Department of Agriculture." Assistance is available to all regardless of race, religion, sex, or national origin.